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Acknowledgments

This brochure was written and designed by John Lewis, a Senior Forecaster, and John Robinson, the Warning Coordination Meteorologist (WCM)...both of the National Weather Service (NWS) in Little Rock.

All graphics and photos were contributed by employees at the NWS in Little Rock except where noted.

 On the cover: The three biggest killers with severe thunderstorms are tornadoes, lightning and flash flooding. Of the three, tornadoes are generally the most feared...but are they the most deadly? You might be surprised with the answer. For more information, go to pages 3-6.

Severe Weather in Arkansas 2005

Straight-line winds - Generally, any wind that is not associated with rotation; used mainly to differentiate thunderstorm winds from tornadic winds. Straight-line winds originate as a downdraft of rain-cooled air, which reaches the ground and spreads out rapidly, producing a potentially damaging gust of wind up to 100 mph. In recent years, there have been several occasions on which winds greater than 100 mph have been measured.

Suction vortex - A small but very intense vortex within a tornado circulation. Several suction vortices typically are present in a multiple-vortex tornado. Much of the extreme damage associated with violent tornadoes is attributed to suction vortices.

Supercell - A relatively long-lived thunderstorm with a persistent rotating updraft. Supercells are rare, but are responsible for a remarkably high percentage of severe weather events - especially tornadoes, extremely large hail, and damaging wind storms.

Tornado - A violently rotating column of air in contact with the ground.

Towering cumulus - A large cumulus cloud with great vertical development, usually with a cauliflower-like appearance, but lacking the characteristic anvil of a cumulonimbus cloud.

Updraft - A small-scale current of rising air. If the air is sufficiently moist, then the moisture condenses to become a cumulus cloud or an individual tower of a towering cumulus or a cumulonimbus.

Upslope flow - Air that flows toward higher terrain, and hence is forced to rise.

Virga - Streaks or wisps of precipitation falling from a cloud but evaporating before reaching the ground.

Wall cloud - A local, often abrupt lowering from the rain-free base of a thunderstorm. Wall clouds can range from a fraction of a mile up to nearly 5 miles in diameter, and normally are found on the south or southwest side of the thunderstorm. When seen from within several miles, many wall clouds exhibit rapid upward motion and counterclockwise rotation. Rotating wall clouds usually develop before strong or violent tornadoes, by anywhere from a few minutes up to nearly an hour. Wall clouds must be monitored visually for signs of persistent, sustained rotation.

Waterspout - In general, a tornado occurring over water. Specifically, it normally refers to a small, relatively weak rotating column of air over water beneath a cumulonimbus cloud or a towering cumulus cloud. (Waterspouts are most frequently observed in shallow waters off the coasts of Texas and Florida. However, they have occurred in Arkansas on some of the larger lakes, and on a few occasions, in the Arkansas River.)

(The terms in this glossary were taken from several National Weather Service publications. This is not an all-inclusive list of all terms associated with severe weather. The terms here were selected because they are the most frequently used in Arkansas -- in weather summaries; and in interviews with the news media.)



As shown in the graphic to left, several offices issue severe thunderstorm and/or tornado warnings for Arkansas. The majority of counties (45) are served by the NWS in Little Rock...with NWS offices outside of Arkansas serving the remaining 30 counties.

Contacts

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MIC - Meteorologist-in-Charge AMIC - Acting Meteorologist-in-Charge
WCM - Warning Coordination Meteorologist
SOO - Science and Operations Officer

Inversion - Usually used in reference to temperature; an increase in temperature with height (which is the reverse of what usually occurs in the atmosphere).

Mammatus clouds - Rounded, sack-like protrusions hanging from the underside of a cloud (usually a thunderstorm anvil). These clouds do not produce severe weather. They often accompany severe thunderstorms, but may accompany non-severe thunderstorms as well.

Mesoscale Convective Complex (MCC) - A large complex of thunderstorms, generally round or oval-shaped, which normally reaches peak intensity at night. An MCC must meet certain criteria for size, duration, and shape. MCCs typically form during the afternoon and evening in the form of several isolated thunderstorms, during which the potential for severe weather is greatest. During peak intensity, the primary threat shifts toward heavy rain and flooding.

Mesoscale Convective System (MCS) - A term often used to describe a cluster of thunderstorms that does not meet the size, duration, or shape criteria of an MCC. It is a complex of thunderstorms, which may be round-shaped or in a line, and normally persists for several hours or more.

Mesocyclone - A region of rotation, typically 2 to 6 miles in diameter, often found on the southwest part of a supercell. The circulation of a mesocyclone covers an area much larger than the tornado which MAY develop within it. This is technically a radar term defining a signature of rotation on Doppler radar that meets specific criteria for magnitude, vertical depth, and duration.

Microburst - A small, concentrated downburst affecting an area less than about 2.5 miles across. Most microbursts are rather short-lived (5 minutes or so), but on rare occasions have been known to last up to 30 minutes.

Outflow boundary - A boundary separating thunderstorm-cooled air (outflow) from the surrounding air; similar in effect to a cold front, with the passage marked by a wind shift and usually a drop in temperature. Outflow boundaries may persist for 24 hours or more after the thunderstorms that generated them dissipate, and may travel hundreds of miles from their area of origin. New thunderstorms often develop along outflow boundaries, especially near the point of intersection with another boundary (cold front, dry line, another outflow boundary).

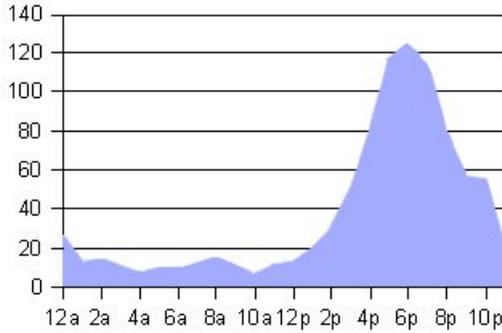
Overrunning - Relatively warm moist air moving above another air mass of greater density (colder air). Embedded thunderstorms sometimes develop in such a pattern; severe thunderstorms (mainly with large hail) can occur, but tornadoes are unlikely.

Pulse storm - A thunderstorm within which a brief period (pulse) of strong updraft occurs, during and immediately after which the storm produces a short episode of severe weather. These storms generally are not tornado producers, but often produce large hail and/or damaging winds.

Risks (Severe Thunderstorm) - The Storm Prediction Center (SPC) assesses risks of severe thunderstorms in its convective outlooks. The risks are for a severe weather event occurring within 25 miles of any given point and are as follows:

are not safe places to hide, even when a weak tornado is approaching. From 2000 to 2004, 5 of 6 tornado deaths occurred in mobile homes.

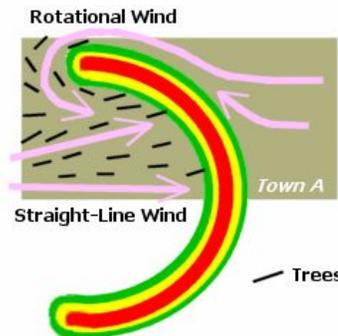
Tornadoes in Arkansas by Hour 1971-2000



So when do tornadoes occur? Statistically, tornadoes are most likely during the afternoon and evening hours (between 3 pm and 8 pm). It is usually during this time frame that peak warming has occurred...and the atmosphere has become its most unstable.

When damage has occurred, tornadoes are often automatically blamed but not necessarily the culprit. In many cases, damage will be the result of straight-line wind.

In the picture: A model of a bow echo (i.e. boomerang shaped line of storms)...with a small tornado (with a narrow path) spawned on the northern end of the bow, and a large swath of straight-line wind produced farther south.



Many people don't realize that straight-line wind can be as damaging as a weak tornado (with speeds over 100 mph)! However, the swath of damage with straight-line wind is often wider than a tornado (on a scale of miles versus yards), and debris is often scattered in a consistent direction.

In the picture: A strong tornado (F2) downed trees in various directions about 4 miles southwest of Searcy (White County) on 11/24/2001.



Air mass thunderstorm - Generally, a thunderstorm not associated with a front or similar type of weather feature. Air mass thunderstorms typically are associated with warm, tropical air in the summer months; they develop during the afternoon in response to heating, and dissipate rather quickly after sunset. They generally are less likely to be severe than other types of thunderstorms.

Anvil - The flat, spreading top of a thunderstorm.

Approaching severe - A thunderstorm which contains winds of 40 to 57 mph or hail around 1/2 inch in diameter.

Bow echo - On radar, a line of thunderstorms that bulges outward into a bow shape. Damaging thunderstorm winds often occur near the center of a bow echo.

Box - A severe thunderstorm watch or tornado watch. The term derives from the fact that a watch takes the shape of a rectangle or parallelogram when plotted on a map.

Cap - A layer of warm air, several thousand feet above the surface, which suppresses or delays the development of thunderstorms. If the air is unstable enough, explosive thunderstorm development can occur if the cap is removed or weakened (for example, when colder air moves in).

Cold air funnel - A funnel cloud or (rarely) a small, relatively weak tornado that can develop from a shower or thunderstorm when the air aloft is unusually cold (hence the reference to "cold air").

Convection - In meteorology, this term is used most often to describe the vertical transport of heat and moisture, especially by updrafts and downdrafts in unstable air. Showers and thunderstorms are forms of convection.

Cumulonimbus cloud - A cloud characterized by strong vertical development in the form of mountains or huge towers, topped at least partially by a smooth, flat anvil. This type of cloud is more commonly known as a thunderstorm or thunderhead.

Cumulus - Detached clouds, generally dense and with sharp outlines, showing vertical development in the form of domes, mounds, or towers. Tops normally are rounded while bases are more horizontal. Cumulus clouds may grow into towering cumulus or cumulonimbus clouds.

Flash Flooding

Water. We swim in it, bathe in it...and drink it. Water seems harmless, and it is the least feared of thunderstorm hazards. So why does it kill close to 130 people annually in this country? Because its power is underestimated.

Flash flooding occurs when the rate of heavy rain exceeds the rate of runoff (into storm drains and creeks/streams).



In the picture: A car was washed off the road in southwest Scott County (western Arkansas) and was swept downstream (i.e. along Haws Creek) on 05/27/2002. The woman driving the car exited the vehicle to try to get help, and was swept downstream.

With nowhere to go, water flows across roads...and sometimes into homes and businesses. This creates a dilemma for motorists...with the question being “do I cross the water or not?” Two things to consider: (1) each foot of water will displace 1,500 pounds of vehicle (two feet of water will float an average car), and (2) estimating the depth of water can be difficult, especially at night. Weighing these factors, driving through water is very risky.



Fact: Half of all flash flood deaths occur in automobiles.

Some people are willing to take the risk, especially those with a tight schedule (when there is seemingly no time to find an alternate route around flood water). The National Weather Service hopes you don't make the wrong decision, and has a simple slogan: “Turn Around Don't Drown”™. For more about this slogan, go on-line to the following address:



<http://www.srh.noaa.gov/tadd>

The largest hailstones reported during the year included:

2¾ inches in diameter (baseball size): Hot Springs (Garland Co.), New Blaine (Logan Co.), 3 miles southeast of Hope (Hempstead Co.), 4 miles northwest of Rosston (Nevada Co.), and at Black Rock (Lawrence Co.).

2½ inches in diameter: Pontoon (Conway Co.).



In the picture: Hail slightly larger than a hen egg was collected near Pontoon (Conway County) on 04/21/2004. The storm producing the hail spawned two weak tornadoes (F1) in Logan, northern Yell and southern Pope Counties (near the Arkansas River).

2 inches in diameter (hen egg size): Petit Jean State Park (Conway Co.), 5 miles north of Harmony (Johnson Co.), and at Chimes (Van Buren Co.).

On March 17th, lightning struck and destroyed a house at Pine Ridge (Montgomery Co.). As firefighters worked to extinguish the blaze, they were pelted with hail up to 1½ inches in diameter.



Flash Floods

There were two flash flood deaths in Arkansas in 2004.

Two children, ages 2 and 3, were killed when a pickup truck was washed off a bridge over Hock Creek 5 miles southwest of Huntsville (Madison Co.).

In the picture: Flash flooding was widespread across northern Arkansas in late April, 2004 (21st through the 24th)...with over 10 inches of rain reported in some areas (including parts of Madison County). Excess water filled the Buffalo and White Rivers, with a motel flooded by Calico Creek (backed up due to high water on the White River) at Calico Rock (Izard County) on 04/25/2004.



Q. Who makes the decision to blow the tornado sirens?

A. City and county officials, not the National Weather Service, make these decisions. Some areas sound the sirens when a tornado warning is issued, while others wait for a sighting of severe weather in their area. Even the testing of tornado sirens varies from one town to another. The sirens may be tested once a week (the day varies from town to town) or once a month. In some areas, a test is postponed if the weather looks threatening that day.

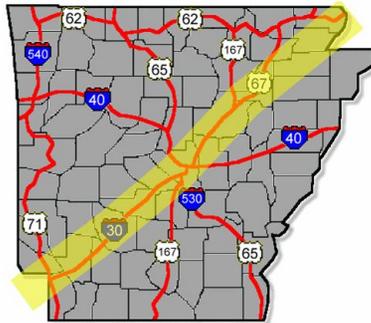
Q. Do all tornadoes produce a sound similar to jet engines or trains?

A. No. There have been reports of some tornadoes that produced very little noise. In addition, strong winds of any type – such as those associated with severe thunderstorms, hurricanes, and blizzards – can produce noises that people believe sound like jet engines or trains.

Q. Are there favored paths for tornadoes in Arkansas?

A. In recent severe weather outbreaks, tornadoes have tended to concentrate along Interstate 30 from Texarkana to Little Rock...and along the U.S. Highway 67/167 corridor from Little Rock to Beebe...Searcy and Newport.

In the picture: "Tornado alley" in Arkansas.

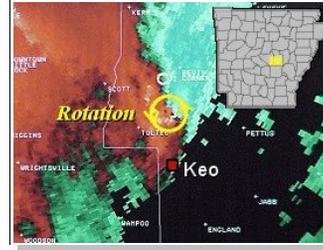


This favored area is on the doorstep to the higher terrain of western Arkansas. Perhaps winds blowing through the terrain create eddies farther east, with the eddies inducing rotation in developing storms. While this may not be exactly what is occurring, it seems that the terrain is the key to the aforementioned "tornado alley".

Q. Where can NOAA Weather Radios be purchased?

A. Department and discount stores, as well as stores that

43. 3.6 miles north of Keo to 2.7 miles south-southwest of Lonoke (Lonoke Co.), November 1st, 12:05 PM – A weak (F0) tornado had a path length of 8.6 miles.



In the picture: The WSR-88D (i.e. Doppler Weather Radar) picked up strong rotation a few miles north of Keo (Lonoke County) during the afternoon of 11/01/2004.

44. 7.5 miles south-southeast of Hampton to 6.2 miles southeast of Hampton (Calhoun Co.), November 1st, 12:55 PM – A weak (F1) tornado had a path length of 2.3 miles.



In the picture: A mobile home was overturned by an F1 tornado about 6.5 miles southeast of Hampton (Calhoun County) on 11/01/2004.

45. 2.2 miles south-southwest of Calmer to 1.5 miles south of Calmer (Cleveland Co.), November 1st, 1:55 PM – A weak (F1) tornado had a path length of 0.7 mile.

46. 0.5 mile south-southwest of Humphrey to 0.8 mile northeast of Humphrey (Jefferson and Arkansas Cos.), November 1st, 2:35 PM – A weak (F0) tornado had a path length of 1.3 miles.

47. 0.8 mile south of Hagarville to 0.7 mile south-southeast of Hagarville (Johnson Co.), November 11th, 1:05 AM – A weak (F0) tornado had a path length of 0.3 mile.

48. 10 miles southwest of Lake Village to 9.5 miles southwest of Lake Village (Chicot Co.), November 23rd, 4:10 PM – A weak (F0) tornado had a path length of 0.5 mile.

Q. Has there ever been an F5 tornado in Arkansas?

A. Only one such tornado has been documented in Arkansas history. It occurred on April 10, 1929, in northern Jackson County, and is known as the "Sneed Tornado".



In the picture: This storm shelter (in the middle of a field about 3 miles north of Swifton in Jackson County) was actually used during the "Sneed Tornado" of 04/10/1929.

The National Weather Service researched this tornado several years ago. You can read more about it at:

<http://www.srh.noaa.gov/lzk/html/tor041029a.htm>

Q. What type of cloud formations might appear before a tornado?



A. The "wall cloud" would be the most important. This is a localized lowering of the base of the thunderstorm. This area of lowering, which appears to be the base of the storm bulging downward, might be as little as one mile across or perhaps as much as five or six miles across.

In the picture: This wall cloud was photographed by Michael Hook, a trained storm spotter, on 05/16/2003.

If you are close enough to a true wall cloud, you should be able to see rotation within the wall cloud. The following publications describe severe weather in depth and include a number of pictures of various cloud formations associated with severe weather. (Note: File sizes are large and will take awhile to download.)

<http://www.nws.noaa.gov/om/brochures/basicspot.pdf>

http://www.nws.noaa.gov/om/brochures/adv_spotters.pdf

24. 3 miles northeast of Manila (Mississippi Co.), June 2nd, 5:50 PM – A weak (F0) tornado had a path length of 0.3 mile.

25. 1.5 miles west of Haskell to 0.8 mile north of Haskell (Saline Co.), October 18th, 8:59 AM – A weak (F1) tornado had a path length of 2 miles.

26. 4 miles southwest of Sardis to 8.3 miles east of Wrightsville (Saline and Pulaski Cos.), October 18th, 9:20 AM – A strong (F2) tornado had a path length of 24 miles. Eleven people were injured.



In the picture: Remains of mobile homes were strewn through trees by an F2 tornado about 2.5 miles south of Sardis (Saline County) on 10/18/2004.

27. 1.8 miles north of England to 2.2 miles southwest of Blakemore (Lonoke Co.), October 18th, 10:07 AM – A weak (F0) tornado had a path length of 3.3 miles.

28. 2 miles southeast of Seaton Dump to 4.7 miles east-northeast of Ulm (Lonoke and Prairie Cos.), October 18th, 10:42 AM – A strong (F2) tornado had a path length of 19 miles. The tornado caused damage in excess of \$12 million at the Stuttgart Airport.

In the picture: Aircraft were thrown around like toys by an F2 tornado at the Stuttgart Airport (near Fairmount in Prairie County) on 10/18/2004.



29. Pocahontas (Randolph Co.), October 18th, 4:50 PM – A weak (F0) tornado had a path length of 2 miles.

30. 6 miles east of Pocahontas to 1 mile northeast of Peach Orchard (Randolph and Clay Cos.), October 18th, 5:05 PM – A weak (F1) tornado had a path length of 13 miles.

31. Lafa to 4 miles north of Marmaduke (Greene Co.), October 18th, 5:10 PM – A weak (F0) tornado had a path length of 8 miles.



When the sun is out and there isn't a cloud in the sky, people go on with their daily plans and tend not to pay much attention to the weather. But how about when the sky turns gray and there is thunder nearby?

Watches



When thunderstorms are expected, people should become more cautious and check the latest forecast. If they find that a Watch is in effect, that means storms in their area **may become** severe...although severe weather **is not imminent**.

Warnings



If a Warning has been posted, that means storms **have become** severe...and severe weather **is imminent** for the specified area(s). People should stop what they are doing and should find a place of safety (i.e. in a permanent structure on the lowest floor away from windows).

What is Severe?

Severe thunderstorms produce at least one of the following: (1) large hail (i.e. 3/4 inch in diameter or larger), (2) wind gusts of 58 mph or greater, and (3) tornadoes. While severe storms can produce flooding rain and deadly lightning, these are not considered severe.

Where Tornadoes Occurred

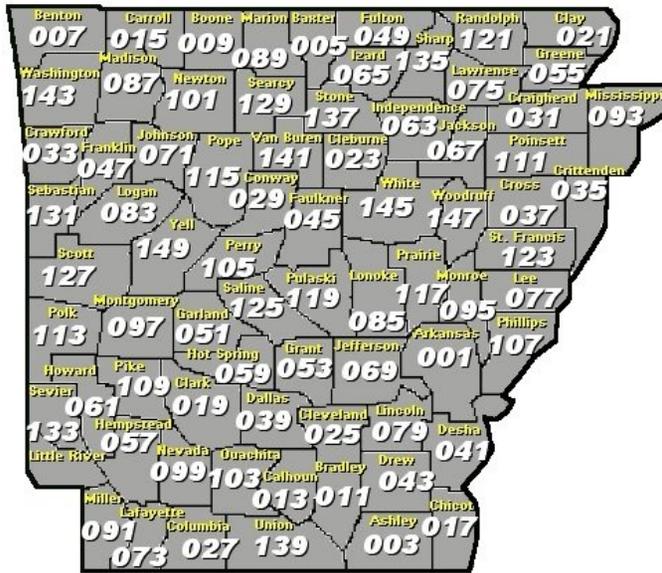
1. Chester (Crawford Co.), March 4th, 6:12 PM – A weak (F0) tornado had a path length of 0.2 mile.
2. 5 miles west of Rocky to 4.8 miles west of Rocky (Polk Co.), April 9th, 7:40 PM – A weak (F0) tornado had a path length of 0.2 mile.
3. 8 miles south-southeast of Big Fork to 13 miles southwest of Black Springs (Polk and Montgomery Cos.), April 9th, 8:36 PM – A weak (F0) tornado had a path length of 2.4 miles.
4. 6 miles east-northeast of Langley to 4.2 miles west-northwest of Salem (Pike Co.), April 9th, 9:00 PM – A weak (F0) tornado had a path length of 2.5 miles.
5. 5 miles south-southeast of Glenwood to 3 miles east of Alpine (Pike and Clark Cos.), April 9th, 9:24 PM – A weak (F1) tornado had a path length of 10.8 miles.
6. 1.3 miles west of New Blaine to 4.7 miles west of Dardanelle (Logan and Yell Cos.), April 21st, 4:13 PM – A weak (F1) tornado had a path length of 12.5 miles.



In the picture: An uprooted tree raised the end of a trailer...with a shed destroyed about 4 miles southeast of New Blaine (Logan County) on 04/21/2004.

7. 4.3 miles southwest of Dardanelle to 8.3 miles south of Pottsville (Yell and Pope Cos.), April 21st, 4:41 PM – A weak (F1) tornado had a path length of 11.5 miles.
8. 2.5 miles northeast of Strickler to 3 miles northeast of Strickler (Washington Co.), April 22nd, 7:22 PM – A weak (F1) tornado had a path length of 0.5 mile.
9. 3 miles north-northeast of Hunt to 2 miles northeast of Ludwig (Johnson Co.), April 22nd, 10:26 PM – A weak (F0) tornado had a path length of 13.1 miles.
10. 1.8 miles southeast of Crabtree to 1 mile northwest of Clinton (Van Buren Co.), April 23rd, 1:30 AM – A weak (F0) tornado had a path length of 4.1 miles.
11. 4.3 miles east-northeast of Cleveland to 5.3 miles northeast of Cleveland (Conway Co.), April 24th, Noon – A weak (F0) tornado had a path length of 1.2 miles.

alerted for severe weather in your area. **Example:** Pulaski County would be "005119."



In the picture: Federal Information Processing System (FIPS) codes for counties in Arkansas.



Below is a breakdown of the number of tornadoes that have been documented for each county in Arkansas since 1950. Tornado deaths that have occurred are in brackets "()".

Arkansas	29(0)	Garland	22(0)	Newton	8(0)
Ashley	24(6)	Grant	16(0)	Ouachita	16(0)
Baxter	17(3)	Greene	25(2)	Perry	10(0)
Benton	31(0)	Hempstead	18(5)	Phillips	16(0)
Boone	11(1)	Hot Spring	30(0)	Pike	12(0)
Bradley	17(7)	Howard	23(10)	Poinsett	32(8)
Calhoun	11(0)	Independence	35(8)	Polk	22(1)
Carroll	8(0)	Izard	19(2)	Pope	16(1)
Chicot	22(1)	Jackson	46(5)	Prairie	23(8)
Clark	30(6)	Jefferson	23(1)	Pulaski	63(13)
Clay	16(1)	Johnson	32(2)	Randolph	10(0)
Cleburne	21(3)	Lafayette	8(0)	St. Francis	17(5)
Cleveland	8(0)	Lawrence	21(1)	Saline	31(12)
Columbia	25(3)	Lee	10(0)	Scott	6(0)
Conway	23(3)	Lincoln	15(5)	Searcy	10(0)
Craighead	30(37)	Little River	11(1)	Sebastian	25(16)
Crawford	18(0)	Logan	19(1)	Sevier	14(0)
Crittenden	13(6)	Lonoke	52(18)	Sharp	13(0)
Cross	15(5)	Madison	8(2)	Stone	16(5)
Dallas	17(1)	Marion	15(6)	Union	26(1)
Desha	19(0)	Miller	18(0)	Van Buren	21(1)
Drew	9(1)	Mississippi	38(5)	Washington	19(1)
Faulkner	42(11)	Monroe	15(0)	White	57(59)
Franklin	12(0)	Montgomery	7(0)	Woodruff	29(30)
Fulton	14(4)	Nevada	15(0)	Yell	20(0)

Total Tornadoes: 1555
Total Deaths: 334